Docket No.: K2580.0101

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Masahiko Maruhashi et al.

Application No.: 10/602,681 Confirmation No.: 1356

Filed: June 25, 2003 Art Unit: 2837

For: DURABLE PERCUSSION PAD EFFECTIVE AGAINST NOISE, SILENT PERCUSSION INSTRUMENT, SILENT PERCUSSION INSTRUMENT SET AND ELECTRONIC PERCUSSION SYSTEM

Examiner: K. R. Lockett

APPEAL BRIEF

U.S. Patent and Trademark Office
220 20th Street S.
Customer Window, Mail Stop Appeal Brief - Patents
Crystal Plaza Two, Lobby, Room 1B03
Arlington, VA 22202

Dear Sir:

As required under § 41.37(a), this brief is filed within two months of the Notice of Appeal filed in this case on July 20, 2005, and is in furtherance of said Notice of Appeal.

You are hereby authorized to charge our credit card for the fee of $500.00 required under Section 1.17(f). PTO Form 2038 is attached.

In the event a fee is required or if any additional fee during the prosecution of this application is not paid, the Patent Office is authorized to

10/21/2005 JADD01 00000004 10602681
02 FC:1402 500.00 OP

charge any underpayment or credit any overpayment to Deposit Account No. 50-2215.

CONTINGENT EXTENSION REQUEST

If this communication is filed after the shortened statutory time period had elapsed and no separate Petition is enclosed, the Commissioner of Patents and Trademarks is petitioned, under 37 CFR 1.136(a), to extend the time for filing a response to the outstanding Office Action by the number of months which will avoid abandonment under 37 CFR 1.135. The fee under 37 CFR 1.17 should be charged to our Deposit Account No. 50-2215.

This brief contains items under the following headings as required by 37 C.F.R. § 41.37 and M.P.E.P. § 1206:

I. REAL PARTY IN INTEREST

The real party in interest for this appeal is:

YAMAHA CORPORATION

II. RELATED APPEALS, INTERFERENCES, AND JUDICIAL PROCEEDINGS

There are no other appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

A. Total Number of Claims in Application

There are 40 claims pending in application.

B. Current Status of Claims

1. Claims canceled: None;
2. Claims withdrawn from consideration but not canceled: None;
3. Claims pending: 1-40;
4. Claims allowed: None;
5. Claims rejected: 1-6, 10-17, 20, and 22-40;
6. Claims objected to: 7-9, 18, 19, and 21.

C. Claims On Appeal

The claims on appeal are claims 1-40.

IV. STATUS OF AMENDMENTS

Appellant filed an Amendment After Final Rejection on June 8, 2005. The Examiner responded to the Amendment After Final Rejection in an Advisory Action mailed June 17, 2005. In the Advisory Action, the Examiner indicated that Appellants' proposed amendments to claims would be entered.

Accordingly, the claims enclosed herein as Appendix A incorporate the amendments to claims as indicated in the paper filed by Appellant on June 8, 2005.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention relates to a percussion instrument and, more particularly, to a percussion instrument using a percussion pad. See, par. 1. The present percussion pad exhibits excellent muting characteristics without sacrificing durability. See, par. 13. The percussion pad comprises a surface to be beaten by a player and an accumulator made of resilient material, connected in series to the surface so as to be locally deformed each time the player strikes the drum. The accumulator accumulates elastic strain energy and vibrates locally while the elastic strain energy is released. A base, made of a less resilient material than the accumulator, is provided on the opposite side of the accumulator from the surface. See, par. 18.

A drum head according to the present invention has a solid portion and a locally vibratory portion. The solid portion offers a surface to be beaten by a drummer and exhibits a large damping factor. The locally vibratory portion is connected in series to the solid portion, and has an energy accumulating sub-

portion. The energy accumulating sub-portion is made of material capable of accumulating a large amount of elastic strain energy. See, par. 47.

Referring to a first embodiment, as shown in FIG. 1 reproduced below, a drum comprises a shell 1, a drum head 2, a rim 3 and a tension regulator 5. The drum head 2 is stretched over an opening of the shell 1, and is clamped between the shell 1 and the rim 3 by means of the tension regulator 5. The drum head 2 has a large damping factor, rapidly suppresses vibrations, accumulates a large amount of elastic strain energy, and exhibits a large amount of force restitution at a beat thereon.

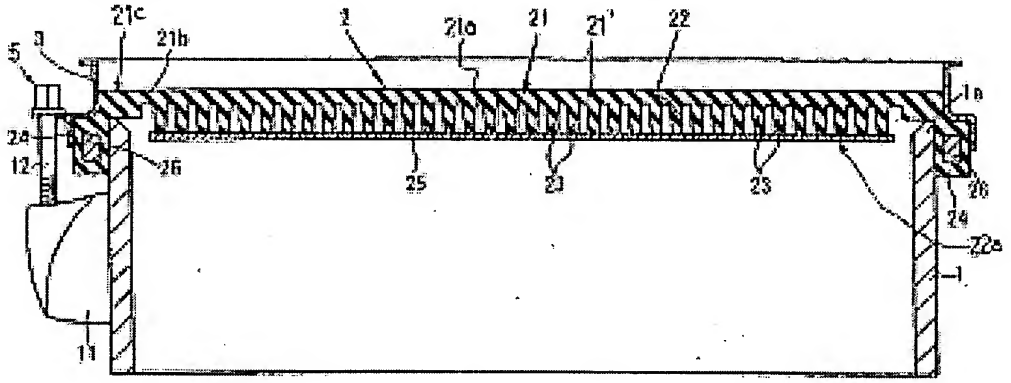


Fig. 1

Drum head 2 includes a head body 21 and a base plate 25. The head body 21 has a disc shape, and provides a continuous flat surface to drummers. The base plate 25 has a disc shape, and is smaller in diameter than the head body 21. The base plate 25 exhibits larger rigidity than the head body 21. When a drummer strikes the head body 21, the base plate 25 keeps itself flat so the

head body 21 is resiliently deformed. Base plate 25 has damping characteristics for suppressing the vibrations. The head body 21 has a solid portion 21' and an accumulating portion 22. The solid portion 21' has a flat surface 21a, and a drummer beats the flat surface 21a during the performance.

Accumulating portion 22 and base plate 25 constitute vibratory portion 22a. Accumulating portion 22a has an array of pillars 23. The pillars 23 project downwardly from the solid portion 21' and are regularly formed under the solid portion 21'. The pillars 23 are constant in height and are adhered to the base plate 25. Since the pillars 23 are spaced from one another, the player only deforms several pillars 23 of the array with each beat. The other pillars remain straight and do not vibrate. Thus, only several pillars transmit the vibrations to the air so that the drum sound faintly reaches the player and audience.

The drum of the present invention can be used in an electronic drum system. A vibration sensor unit is attached to the drum head and is connected to an electronic drum sound generator. A drum equipped with the vibration sensor unit is an "electronic drum." The electronic drum is a component of the electronic drum system.

FIG. 13, reproduced below, shows an electronic drum fabricated based on the drum shown in FIG. 1. The upper edge of the rim 3 is covered with the rim cover 37, and a drummer gives rim shots onto the rim cover 37. The other components are labeled with the references designators corresponding to the drum shown in FIG. 1.

The electronic drum includes vibration sensors 40, 50, and 60, and an electronic sound generating system 69. The beats on the drum head 2 are referred to as "pad shots" and the shots on the rim cover 37 are referred to as "rim shots".

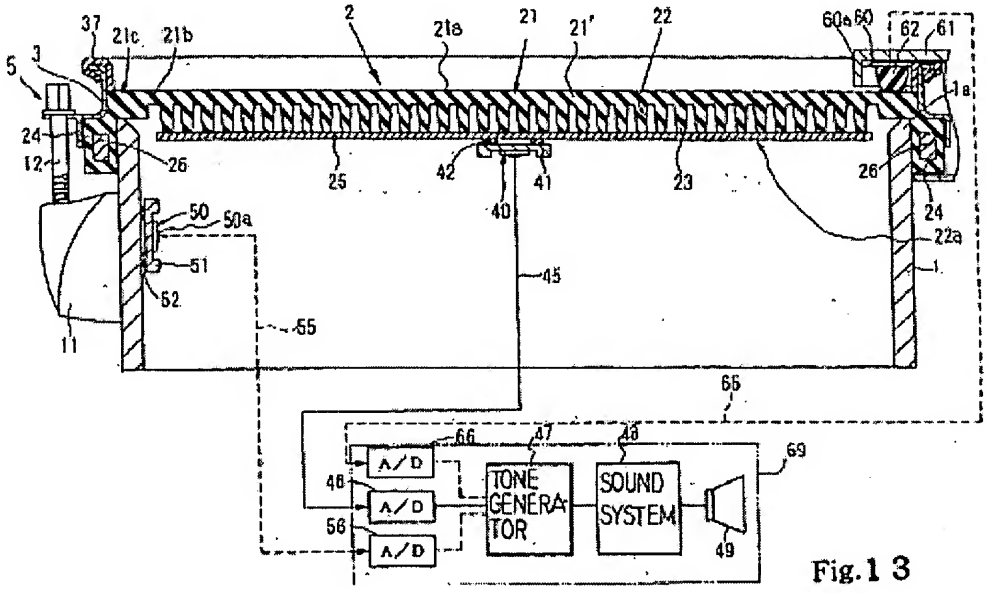


Fig. 13

The vibration sensors 40 converts the pad shots to an electric signal representative of the waveform of the vibrations and is secured to the lower surface of the base plate 25. The vibration sensor 50 converts the rim shots to an electric signal representative of the vibrations and is secured to the inner surface of the shell 1. The vibration sensor 60 is secured to the lower surface of a sensor holder 61, which inwardly projects from the rim 3, converts both pad and rim shots to an electric signal representative of the vibrations. Although the electronic drum shown in FIG. 13 has the three sensors 40/50/60, other electronic drums have only one or two vibration sensors 40/50/60.

The vibration sensor 40 includes a piezoelectric converter 40a, a sensor boat 41, and a sheet of vibration absorber 42. The sensor boat 41 has a disc shape to equalize the vibrations regardless of the spots beaten with the sticks. The vibration absorber 42 is ring-shaped, and eliminates high-frequency noise components from the vibrations. The piezoelectric converter 40a includes a piezoelectric crystal 40b, a lead 43, and a connector 44. The piezoelectric crystal 40b is secured to the lower surface of the sensor boat 41, and the lead 43 is connected at one end thereof to the piece of piezoelectric crystal 40b and at the other end to the connector 44. The signal line 45 is connected through the connector 44 to the lead 43. The vibration absorber 42 is adhered to the peripheral area of the upper surface of the sensor boat 41, and is further adhered to the lower surface of the base plate 25. The piezoelectric converter 40a is located at the center of the lower surface of the base plate 25 so that the sensitivity is constant to the vibrations propagated from any area on the flat surface 21a.

When a drummer strikes the flat surface 21a with the stick, the stick causes drum head 2 to vibrate, and the vibrations are propagated to the vibration sensor 40a through the sheet of vibration absorber 42 and sensor boat 41. The vibration absorber 42 eliminates high-frequency noise components from the vibrations, and low frequency vibrations, which represent the shake at the impact and the up-and-down motion of the drum head 2, causing strain in the piezoelectric crystal 40b. The piezoelectric crystal 40b converts the strain to electric charge, and the electric charge is fed from the vibration sensor 40 to the signal line 45.

Vibration sensor 50 is secured to the inner surface of the shell 1 in a similar manner to the vibration sensor 40. Piezoelectric converter 50a is adhered to a sensor boat 51, and the sensor boat 51 is adhered to the inner surface through a sheet of vibration absorber 52.

Vibration sensor 60 includes a piezoelectric converter 60a that is adhered to the lower surface of the holder 61. A sheet of vibration absorber may be inserted between the holder 61 and the piezoelectric converter 60a for eliminating noise components from the vibrations. The vibration sensor 60 further includes a vibration absorbing block 62 to eliminate noise components from the vibrations. The vibration absorbing block 62 is adhered to the piezoelectric converter 60a. The vibration absorbing block 62 is in contact with the flat surface 21a of the drum head 2.

The electronic sound generating system 69 includes analog-to-digital converters 46, 56, and 66, a tone generator 47, a sound system 48, and loud speakers 49. The signal lines 45, 55, and 65 are connected between the vibration sensors 40, 50, and 60 and the analog-to-digital converters 46, 56, and 66. The electric signals arrive at the analog-to-digital converters 46, 56, and 66, and are converted to series of digital codes representative of the discrete values of the electric signals.

Tone generator 47 is connected to the sound system 48, and the sound system 48 equalizes and amplifies the audio signal. The sound system 48 is responsive to a volume control dial, and varies the gain of the power amplifier. The audio signal is supplied from the sound system 48 to the loud speakers 49, and is converted to the electronic beats through the loud speakers 49.

VI. GROUNDS OF OBJECTION TO BE REVIEWED ON APPEAL

A. The rejection under 35 U.S.C. § 102(b) of claims 1, 2, 14-16, 20, 22, 25, and 28 in view of Belli.

B. The rejection under 35 U.S.C. § 103(a) of claims 1, 2, 14-16, 20, 22, 25, and 28.

C. The rejection under 35 U.S.C. § 103(a) of claims 3-6, 10-13, 17, 23-24, 26, 27, and 29-40.

VII. ARGUMENT

Claims 1-40 are pending in this application. Claims 1-6, 10-17, 20, and 22-40 stand rejected and claims 7-9, 18, 19, and 21 are objected to. Appellant respectfully submits that each of the pending claims is in immediate condition for allowance and requests withdrawal of the pending rejections.

A. Claims 1, 2, 14-16, 20, 22, 25, and 28 are not anticipated by U.S. Patent No. 4,589,323 ("Belli").

Appellants submit that Belli fails to disclose all the features of the present invention defined in claims 1-2, 14-16, 20, 22, 25, and 28, in particular, the explicitly recited accumulator.

To anticipate a claim under 35 U.S.C. § 102, the cited reference must disclose every element of the claim, as arranged in the claim, and in sufficient detail to enable one skilled in the art to make and use the anticipated subject matter. See, PPG Industries, Inc. v. Guardian Industries Corp., 75 F.3d 1558, 1566 (Fed. Cir. 1996); C.R. Bard, Inc. v. M3 Sys., Inc., 157 F.3d 1340, 1349 (Fed. Cir. 1998). A reference that does not expressly disclose all of the elements of a claimed invention cannot anticipate unless all of the undisclosed elements

are inherently present in the reference. See, Continental Can Co. USA v. Monsanto Co., 942 F.2d 1264, 1268 (Fed. Cir. 1991).

The present claims recite an accumulator made of resilient material and having an array of pillars. The pillars are connected in parallel to the surface so the player locally deforms them at each beat. After accumulating elastic strain energy, the deformed pillars vibrate while the elastic strain energy is being released. The accumulator or array of pillars vibrate so as to consume the vibration energy. This results in reduction of percussion sound.

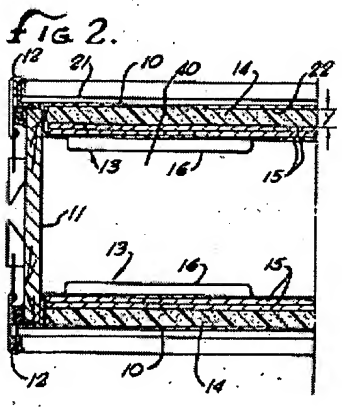
In contrast, Belli discloses a sheet of plastic foam material (14), which dampens vibration energy through internal friction so as to eliminate the overtones from the drum sound, without reducing the drum sound. Belli fails to disclose an array of pillars as recited in Appellants' claims. Thus, the particular feature of the present invention defined in independent claims 1, 20, 28 and 37 is not disclosed in the cited reference Belli.

In Belli as shown in Figure 2 reproduced below, in place of the claimed accumulator there is a sheet of plastic foam material (14). The apparatus in Belli cannot be used in silent performance. If an electronic percussion sound generator is added, as defined in independent claim 37, the drum sound is mixed with the electronic drum sound. The resulting drum sound is noisy because of the combination of electronic sound and percussion sound.

Belli discloses a type of drum muffler. The prior art drum includes "a sheet of plastic foam material 14." The Examiner asserts that the sheet of plastic foam material (14) serves as the "accumulator." The sheet of plastic foam

material (14) may exhibit "sound absorbing characteristics." The sheet of plastic foam material (14) behaves differently from the array of pillars. As stated in Belli, the sheet of plastic foam material (14) reduces the overtones. See Belli, column 1, line 46- 47, column 2, lines 57 to column 3, line 5). However, the prior art drum muffler does not reduce the vibration energy as recited in the pending claims. As taught by Belli "the present invention also provides a means for harmonically altering the overtones of a drum without reducing the sound." See Belli, column 1, lines 58- 60 (emphasis added). In other words, the prior art drum muffler disclosed in Belli merely varies the frequency spectrum of the drum sound.

Belli suggests through the description recited above that he expects friction loss in the sheet of plastic foam material (14). As well known to the skilled persons, the internal friction loss makes high-frequency vibrations decay more rapidly rather than low-frequency vibrations. Thus, the Appellants assert that the accumulator and array of pillars are clearly distinguishable from the prior art drum muffler taught by Belli.



Thus, the percussion pad defined in independent claim 1, the silent percussion instruments defined in amended independent claims 20 and 28 and an electronic percussion system defined in amended independent claim 37 are not disclosed by Belli.

B. Claims 1, 2, 14-16, 20, 22, 25, and 28 are not obvious over U.S. Patent No. 6,525,249 ("Suenaga") in view of U.S. Patent No. 4,852,443 ("Duncan").

The Advisory Action rejects Appellants' pending claims as being unpatentable over Suenaga in view of Duncan. Appellants respectfully submit that the pending claims are not obvious in view of the cited combination.

To establish a *prima facie* case of obviousness, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify a reference or combine references to arrive at the claimed subject matter. The prior art references must also teach or suggest all the limitations of the claim in question. See, M.P.E.P. § 706.02(j). A reference can only be used for what it clearly discloses or suggests. See, In re Hummer, 113 U.S.P.Q. 66 (C.C.P.A. 1957); In re Stencel, 4 U.S.P.Q.2d 1071, 1073 (Fed. Cir. 1987). Here, the references, whether taken individually or in combination, do not disclose or suggest the invention claimed by the Appellant.

Nowhere does Suenaga show or suggest, as required by independent claims 1, 20, 28 and 37 of the present application, a percussion pad including "a surface to be beaten by a player, the surface being ***smooth and extending without apertures***" (Emphasis added.) In contrast, Suenaga has apertures

rather than being smooth and extending without apertures. As Suenaga itself acknowledges, drumhead 11 has "plenty of apertures (or small opening holes) 32." (Column 3, lines 48-49.) The apertures 32 are clearly shown in Figure 2 of Suenaga, reproduced below. Each independent claim of the present application, however, has a surface "being smooth and extending without apertures."

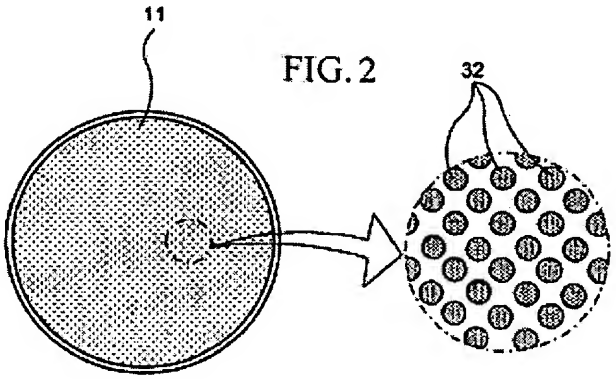


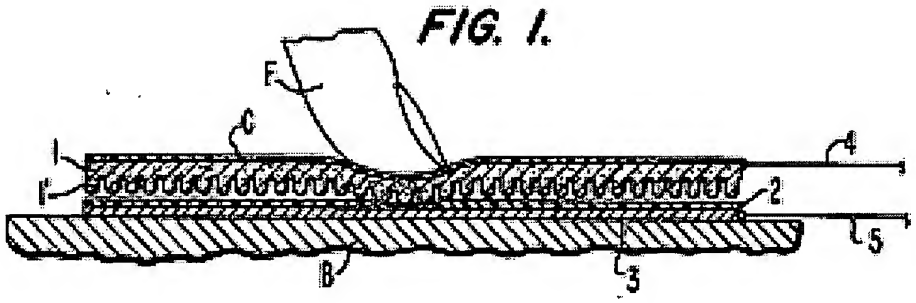
FIG. 2

In Suenaga, the drum sounds are reduced through the drumhead 11 by the apertures 32 formed in the drum. The apertures 32 act as Suenaga's muting structure (see, Suenaga reference, col. 4, lns. 56-62).

Further, Duncan does not teach or suggest any muting means in the whole text. Appellants note that Duncan's pillars are not aimed at the reduction of vibratory energy through the local vibrations of pillars. In Duncan, as shown below, tapered projections (1'), are deformed to change capacitance (col. 2, lns. 59-62). If a person skilled in the art equipped the percussion instrument with a variable capacitor, he or she would replace the variable capacitor with Duncan's capacitive pressure sensor.

Duncan relates to a "CAPACITIVE PRESSURE SENSING METHOD and APPARATUS". Duncan's structure does not relate to any percussion pad, percussion instrument and electronic percussion system. Even if Duncan shows an array of pillars, Duncan's array of pillars does not reduce an area through which the vibration energy is transferred to the air. In fact, Duncan teaches that the tapered projections (1 ') serves as a part of the electrode, which forms the capacitor together with the thin dielectric layer (2) and the other electrode (3) (see column 2, lines 44-57). Duncan does not expect the array of tapered projections (1 ') to reduce sound, but makes the array of tapered projection (1 ') locally brought into contact with the thin dielectric layer (2) so as to "produce greater capacitive effect" (see column 3, lines 1-15).

If a person skilled in the art requires a variable capacitor for a percussion pad, he or she may employ the variable capacitor taught by Duncan in the percussion pad. However, there is no motivation to use the prior art conductive electrode for a capacitor as an accumulator for accumulating elastic strain energy. Note that the claimed array of pillars does not aim at accumulation of electric charge. The array of pillars defined in the independent claims is expected to accumulate the "elastic strain energy". Thus, Appellants submit that Duncan does not disclose the accumulator having an array of pillars recited in the pending claims. There is no motivation to replace Suenaga's muting structure with the capacitor electrode in Duncan. Further, even if these references were combined, the resultant combination would not read on the presently claimed invention. Thus, the Appellants assert that a prima facie case of obviousness has not been made and the rejection of the independent claims is improper.



Claim 1 further requires "a base . . . held ***in contact*** with said accumulator." The Examiner asserted that Duncan's "pillars" are projections 1', and Duncan's "base" is electrode 3 (see Figure 1). However, in Duncan, projections 1' are ***not in contact*** with electrode 3, as required by claims 1 and 3. As seen in Figure 1, there is a gap between projections 1' and electrode 3. Thus, contrary to the Examiner's assertions, Duncan cannot supply the missing limitation of "a base . . . held in contact with said accumulator." Thus, for this additional reason, the combination of Suenaga and Duncan fail to render Appellants' claims obvious.

C. Claims 3-6, 10-13, 17, 23-24, 26, 27, and 29-40 are not obvious over Belli in view of Suenaga, Duncan, or U.S. Patent No. 4,479,412 ("Klynas").

Claims 3-6, 10-13, 17, 23-24, 26, 27, and 29-40 stand rejected under 35 U.S.C. § 103(a). The Examiner additionally combines three documents, i.e., Duncan, Suenaga and Klynas with Belli and asserts that the present invention defined in the dependent claims is obvious to the skilled persons. Appellants respectfully disagree and request the withdrawal of this rejection.

The rejected dependent claims are directly or indirectly dependent on independent claims 1, 20, 28 and 37. In other words, the particular features discussed above are brought into the rejected dependent claims. As described above, Belli, Suenaga, and Duncan are each silent regarding explicitly recited features of the present invention.

Although the Examiner argued that the present invention was disclosed in Suenaga (Office Action dated December 6, 2004, page 2), the Examiner changed the grounds for rejection from Suenaga to Belli in the Final Official Action. Thus the Examiner admitted that Suenaga is silent to the particular feature of the present invention. Further, as discussed above, Duncan fails to disclose Appellants' explicitly recited accumulator.

Klynas discloses drum pad isolation incorporated in an electronic percussion synthesizer. However, Klynas fails to disclose Appellants' explicitly recited pillars. In Klynas, the transducers are mechanically isolated from each other (see the abstract). In the description, "the grommets 80 act to mechanically isolate the drum 40 from the housing 12 in such a manner which prevents undesirable mechanical coupling to the housing 12 and to the other drums" (see column 10, lines 21 to 24). No other means for reducing the vibration is disclosed in Klynas. Klynas is silent as to how the grommets reduce vibrations. However, it is clear that the grommets are neither locally deformed nor vibrate, nor are they the explicitly recited pillars. Tabs (72) are held in contact with entire grommets (80) as shown in figure 2. Thus, they can neither deform nor vibrate. The grommets are quite different from the claimed array of pillars. Thus, Klynas is silent to the particular feature of the present invention.

Claims 14-16 require "a supporter for keeping said base held in contact with said accumulator." Further, claim 24 depends from claim 22, which likewise requires "a supporter for keeping said base held in contact with said accumulator." However, the Office Action states that "[i]t would have been obvious to one having ordinary skill in the art to modify Suenaga's pad as taught by Belli et al. to include a supporter formed by a protection sheet . . . for the purpose of supporting the base." However, Belli teaches "an insertable plastic support means to hold a layer of resilient foam against the underside of a drum head. The foam reduces the sound of the drum while reducing the drum overtones." (Column 1, lines 43-47.) In other words, Belli's foam support 14 is for the purpose of muting and not, as the Office Action states, "for the purpose of supporting the base." In view of the above, the Office Action has failed to show that claims 14-16 and 24 are unpatentable over the combination of Suenaga and Belli. Withdrawal of the rejections on these claims is thus respectfully requested.

As described above, the particular feature of the present invention defined in independent claims 1, 20, 28, and 37 is neither disclosed nor suggested in Suenaga, Duncan and Klynas. In this situation, even if the teachings of Suenaga, Duncan and Klynas are combined with the teachings of Belli, the combination does not reduce the sound through the local vibrations of the pillars. In other words, the present invention defined in amended claims 1, 20, 28, and 37 is patentable over the combination. Thus, the Appellants respectfully request the Board withdraw the rejection under 35 U.S.C. § 103(a).

VIII. CLAIMS

A copy of the claims involved in the present appeal is attached hereto as Appendix A. As indicated above, the claims in Appendix A do include the amendments filed by Appellant on June 8, 2005, and do not include the amendment(s) filed on June 8, 2005.

IX. EVIDENCE

No evidence pursuant to §§ 1.130, 1.131, or 1.132 or entered by or relied upon by the examiner is being submitted.

X. RELATED PROCEEDINGS

No related proceedings are referenced in II. above, or copies of decisions in related proceedings are not provided, hence no Appendix is included.

Dated: October 20, 2005

Respectfully submitted,

By_____
Ian R. Blum
Registration No.: 42,336
DICKSTEIN SHAPIRO MORIN &
OSHINSKY LLP
1177 Avenue of the Americas
New York, New York 10036-2714
(212) 835-1400
Attorney for Appellant

IRB/mgs/bi

APPENDIX A

Claims Involved in the Appeal of Application Serial No. 10/602,681

1. A percussion pad comprising

a surface to be beaten by a player, the surface being smooth and extending without apertures,

an accumulator made of resilient material and having an array of pillars, said pillars being connected in parallel to said surface so as to be locally deformed at each beat by said player for accumulating an elastic strain energy, the deformed pillars being vibratory while said elastic strain energy is being released, and

a base made of a material smaller in resiliency than said, provided on the opposite side of said accumulator to said surface and held in contact with said accumulator for permitting said accumulator to be locally deformed.

2. The percussion pad as set forth in claim 1, further comprising a solid portion made of a resilient material having a large damping factor and having an obverse surface serving as said surface and a reverse surface connected to said array of pillars.

3. The percussion pad as set forth in claim 2, in which said array of pillars projects from said reverse surface of said solid portion toward said base.

4. The percussion pad as set forth in claim 3, in which said solid portion and said array of pillars are formed in a monolithic pad body.

5. The percussion pad as set forth in claim 4, in which said monolithic pad body is made of elastomer.

6. The percussion pad as set forth in claim 3, in which said pillars are shaped into a frustum, and are integral with said solid portion.

7. The percussion pad as set forth in claim 3, in which said array has large-sized pillars and small-sized pillars.

8. The percussion pad as set forth in claim 3, in which said array contains the pillars arranged at a high density and other pillars arranged at a low density.

9. The percussion pad as set forth in claim 3, further comprising a cushion layer made of said resilient material and having an obverse surface bonded to said accumulator and a reverse surface bonded to said base.

10. The percussion pad as set forth in claim 1, in which said accumulator is formed by an array of pillars projecting from a solid portion made of a resilient material, and surfaces at the tips of said pillars form in combination said surface to be beaten by said player.

11. The percussion pad as set forth in claim 10, said solid portion and said array of said pillars are formed in a monolithic pad body.

12. The percussion pad as set forth in claim 11, in which said monolithic pad body is made of elastomer.

13. The percussion pad as set forth in claim 10, further comprising a cover sheet made of a durable resilient material and having an obverse surface serving as said surface and a reverse surface bonded to said surfaces at said tips of said pillars.

14. The percussion pad as set forth in claim 1, further comprising a supporter for keeping said base held in contact with said accumulator.

15. The percussion pad as set forth in claim 14, in which said supporter is formed by a protection sheet covering a reverse surface of said base reverse to an obverse surface held in contact with said accumulator and secured to said accumulator.

16. The percussion pad as set forth in claim 14, in which said protection sheet is formed with an air-vent allowing the air to pass therethrough when said accumulator is deformed.

17. The percussion pad as set forth in claim 1, further comprising a head body made of a resilient material and having an obverse surface serving as said surface and an array of pillars for accumulating an elastic strain energy at each beat and connected in series to said accumulator.

18. The percussion pad as set forth in claim 17, in which said accumulator is formed by another array of pillars projecting from a solid portion to said base, and said array of pillars is held in contact with said solid portion.

19. The percussion pad as set forth in claim 18, further comprising another base smaller in resiliency than said array of pillars and provided between said array of pillars and said solid portion.

20. A silent percussion instrument comprising:

a percussion pad including a surface to be beaten by a player, the surface being smooth and extending without apertures,

an accumulator made of resilient material and having an array of pillars connected in parallel to said surface so as to be locally deformed at each beat by said player for accumulating an elastic strain energy, the deformed pillars being vibratory while said elastic strain energy is being released, and

a base made of a material smaller in resiliency than said accumulator, provided on the opposite side of said accumulator from said surface and held in contact with said accumulator for permitting said accumulator to be locally deformed;

a supporting structure for keeping said percussion pad in an attitude convenient to be beaten by said player; and

a coupling device connected between said percussion pad and said supporting structure for preventing said percussion pad from separation from said supporting structure.

21. The silent percussion instrument as set forth in claim 20, in which said percussion pad further includes a solid portion made of a resilient material and connected in series to said array of pillars a rigid portion coupled to said supporting structure by means of said coupling device and a resilient portion provided between said solid portion and said rigid portion for permitting said

percussion pad to repeatedly move in a direction in which said drummer exerts a force on said surface.

22. The silent percussion instrument as set forth in claim 20, further comprising a supporter for keeping said base held in contact with said accumulator.

23. The silent percussion instrument as set forth in claim 22, in which said supporter has

plural brackets secured to said supporting structure at intervals and

plural cushion blocks respectively secured to said plural brackets and held in contact with said base for preventing said base from separation from said accumulator.

24. The silent percussion instrument as set forth in claim 22, in which said supporter has a protection layer covering a reverse surface of said base and secured to a peripheral portion of said solid portion.

25. The silent percussion instrument as set forth in claim 20, in which said percussion pad and said supporting structure have a shape analogous to that of a drum head forming a part of an acoustic drum and another shape analogous to that of a shell forming another part of said acoustic drum.

26. The silent percussion instrument as set forth in claim 20, further comprising at least one vibration sensor monitoring said percussion pad to see whether or not said player gives said surface an impact and producing an electric signal representative of said impact when said at least one vibration sensor finds said player to give said impact.

27. The silent percussion instrument as set forth in claim 26, further comprising another vibration sensor monitoring said supporting structure to see whether or not said player gives an impact to said supporting structure and producing an electric signal representative of said impact when said another vibration sensor finds said player to give said impact.

28. A silent percussion instrument set comprising plural silent percussion instruments, at least one of said plural silent percussion instruments including

a percussion pad having a surface to be beaten by a player, the surface being smooth and extending without apertures,

an accumulator made of resilient material and having an array of pillars, said pillars being connected in parallel to said surface so as to be locally deformed at each beat by said player for accumulating an elastic strain energy, the deformed pillars being vibratory while said elastic strain energy is being released and a base made of a material smaller in resiliency than said accumulator, provided on the opposite side of said accumulator to said surface and held in contact with said accumulator for permitting said array of pillars to be locally deformed,

a supporting structure for keeping said percussion pad in an attitude convenient to be beaten by said player, and

a coupling device connected between said percussion pad and said supporting structure for preventing said percussion pad from separation from said supporting structure.

29. The silent percussion instrument set as set forth in claim 28, in which said one of said plural silent percussion instruments further comprises at least

one vibration sensor monitoring said percussion pad to see whether or not said player gives said surface an impact and producing an electric signal representative of said impact when said at least one vibration sensor finds said player to give said impact.

30. The silent percussion instrument set as set forth in claim 29, in which said one of said plural silent percussion instruments further comprises another vibration sensor monitoring said supporting structure to see whether or not said player gives an impact to said supporting structure and producing an electric signal representative of said impact when said another vibration sensor finds said player to give said impact.

31. The silent percussion instrument set as set forth in claim 28, in which the others of said plural silent percussion instruments have respective percussion pads, respective supporting structures and respective coupling devices respectively similar to said percussion pad, said supporting structure and said coupling device.

32. The silent percussion instrument as set forth in claim 31, in which each of said others of said plural silent percussion instruments includes at least one vibration sensor monitoring said percussion pad to see whether or not said player gives said surface an impact and producing an electric signal representative of said impact when said at least one vibration sensor finds said player to give said impact.

33. The silent percussion instrument set as set forth in claim 32, in which each of said others of said plural silent percussion instruments further includes another vibration sensor monitoring said supporting structure to see whether or

not said player gives an impact to said supporting structure and producing an electric signal representative of said impact when said another vibration sensor finds said player to give said impact.

34. The silent percussion instrument set as set forth in claim 32, further comprising a percussion sound generating system connected to said at least one vibration sensor of said one of said plural silent percussion instruments and said at least one vibration sensor of said each of said others of said plural silent percussion instruments and selectively producing different sorts of percussion sound in response to said electric signals.

35. The silent percussion instrument set as set forth in claim 28, in which said one of said plural silent percussion instruments has an external appearance close to an acoustic drum.

36. The silent percussion instrument set as set forth in claim 28, in which said one of said plural silent percussion instruments has an external appearance close to an acoustic cymbal.

37. An electronic percussion system, comprising:

a silent percussion instrument including a percussion pad including a surface to be beaten by a player, the surface being smooth and extending without apertures,

an accumulator made of resilient material, connected in series to said surface so as to be locally deformed at each beat by said player for accumulating an elastic strain energy and locally vibratory while said elastic strain energy is being released and

a base made of a material smaller in resiliency than said accumulator, provided on the opposite side of said accumulator from said surface and held in contact with said accumulator for permitting said accumulator to be locally deformed, a supporting structure for keeping said percussion pad in an attitude convenient to be beaten by said player and a coupling device connected between said percussion pad and said supporting structure for preventing said percussion pad from separation from said supporting structure;

at least one vibration sensor monitoring said percussion pad to see whether or not said player beats said surface and producing an electric signal when said player gives each beat to said surface; and

an electronic percussion sound generator connected to said at least one vibratory sensor, carrying out a data processing on pieces of data information on said electric signal for producing an audio signal and converting said audio signal to an electronic percussion sound.

38. The electronic percussion system as set forth in claim 37, in which said at least one vibration sensor monitors said percussion pad to see whether or not said player gives an impact thereto, and produces said electric signal representative of said impact.

39. The electronic percussion system as set forth in claim 38, further comprising another vibration sensor monitoring said supporting structure to see whether or not said player gives an impact thereto and producing another electric signal representative of said impact, and in which said another electric signal is supplied to said electronic percussion sound generator so as to be processed as similar to said electric signal.

40. The electronic percussion system as set forth in claim 38, in which said at least one vibration sensor monitors said percussion pad and said supporting structure to see whether or not said player gives an impact thereto, and produces said electric signal representative of said impact, and in which said electronic percussion sound generator selectively produces different sorts of electronic percussion sound depending upon the decision on said electric signal.